AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

1. (Currently Amended) ~~High-speed~~ In a method of depositing diamond films from ~~the~~ a gaseous phase in ~~the~~ a plasma of a microwave discharge, when the microwave discharge is formed in ~~the~~ a gaseous mixture placed in ~~the~~ a reaction chamber and ~~consisting of~~ comprising at least hydrogen and hydrocarbon, wherein the ~~said~~ gaseous mixture is activated by means of a microwave discharge to form atoms of hydrogen and carbon-containing radicals, and the latter are deposited on the substrate and form a polycrystalline diamond film as the result of surface reactions, ~~which differs in that~~ the improvement which comprises:

activating the ~~said~~ gaseous mixture ~~is activated by means of increasing~~ so as to increase a density of electrons, Ne, in the plasma by means of creating a stable, non-equilibrium plasma with ~~its~~ a power at least 1 kW and frequency f that exceeds ~~by far the~~ a frequency of 2.45 GHz, ~~which is used commonly~~, in the reaction chamber~~, and,~~ in order to localize the plasma~~,~~ as a standing ~~wave~~

microwave with nodes near the substrate is formed ~~and at its nodes plasma layers with the possibility to control their dimensions~~ as a layer over the substrate which plasma is ~~are~~ generated and maintained by microwave beams directed at and converging on the standing microwave so as to deposit diamond film on the substrate.

2. (Currently Amended) ~~High-speed~~ The method ~~as described in par. 1,~~ of Claim 1 ~~which differs in that the~~ wherein said gaseous mixture is activated by means of increasing electron density Ne by using electromagnetic radiation with its frequency f equal to 30 GHz, and the dimensions of the plasma layers in the nodes of the standing microwave are controlled by changing the profiles and size of ~~the~~ a transverse cross-section of the crossing wave beams that form the standing wave.

3. (Currently Amended) ~~High-speed~~ The method ~~as described in par. 1 or par. 2,~~ of Claim 1 or 2 wherein ~~which differs in that~~ four or more of the wave beams that are crossed pairwise are used to form the standing wave.

4. (Currently Amended) ~~High-speed~~ The method ~~as described in par. 1 or par 2,~~ of Claim 1 or 2 wherein ~~which differs in that~~ two converging crossing wave beams are used to form the standing wave.

5. (Currently Amended) ~~High-speed~~ The method ~~as described in par. 1 or par. 2,~~ of Claim 1 or 2 wherein ~~which differs in that~~ two converging opposite wave beams are used to form the standing wave.

6. (Currently Amended) ~~High-speed~~ The method ~~as described in par. 1 or par. 2,~~ of Claim 1 or 2 wherein ~~which differs in that~~ the wave beam is incident on the substrate and the wave beam is reflected from the substrate ~~are used~~ to form the standing wave.

7. (Currently Amended) ~~Plasma~~ A reactor system for ~~high-speed~~ deposition of diamond films from ~~the~~ a gaseous phase in ~~the~~ a plasma of a microwave discharge, which system contains a microwave generator, a transmission line ending with a quasi-optical electrodynamic system, a reaction chamber with a substrate on a substrate holder placed in ~~it~~ the chamber, and a system for pump-in and pump-out of the selected gaseous mixture, ~~which differs in that the~~ the

improvement which comprises a quasi-optical electrodynamic system ~~is made and installed such as to make it possible to~~ adapted to form a standing microwave in ~~the~~ an area selected in ~~the~~ a vicinity of the substrate, and the transmission line is ~~made as~~ an oversized circular waveguide with corrugation of its internal surface, which is supplemented with a mirror system to transfer at least one Gaussian beam to the said quasi-optical electrodynamic system.

8. (Currently Amended) ~~Plasma~~ The reactor ~~as described in par. 7,~~ system of Claim 7 ~~which differs in that~~ wherein the quasi-optical system ~~is made of~~ has four mirrors situated on different sides relative to ~~the~~ a region of plasma formation and ~~installed in order to make it possible~~ to direct the microwave radiation as four wave beams, wherein the crossing is pairwise, and wherein the quasi-electrodynamic system together with a part of the transmission line are installed within the reaction chamber, and wherein the transmission line is supplemented with a divider, which divides one wave beam into four beams and is installed at ~~the~~ an output of the said oversized circular waveguide.

9. (Currently Amended) ~~Plasma~~ The reactor ~~as described in par. 7,~~ system of Claim 7 wherein ~~which differs in that~~ the quasi-optical system is made of two mirrors situated on different sides relative to ~~the~~ a region of plasma formation ~~and installed in order to make it possible~~ positioned so as to direct the two beams of the microwave radiation at small angles to ~~the~~ a ~~substrate~~ surface of the substrate, and the transmission line is supplemented with a divider, which divides one wave beam into two beams and is installed at ~~the~~ an output of the said oversized circular waveguide.

10. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in par. 7,~~ of Claim 7 wherein ~~which differs in that~~ the quasi-optical system is made of two mirrors situated on different sides relative to ~~the~~ a region of plasma formation and ~~installed in order to make it possible~~ positioned so as to direct the wave beams opposite to each other, and wherein one of the two mirrors is installed so as to be movable forward and backward parallel to itself to ~~the~~ a distance of $\pm\lambda/4$, where λ is microwave radiation wavelength, and wherein the transmission line is supplemented with a divider, which divides one wave beam into two beams and is installed at ~~the~~ an output of the said oversized circular waveguide.

11. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in par. 7,~~ of Claim 7 wherein ~~which differs in that the~~ a bottom part of the reaction chamber has a dielectric window to inject microwave radiation, and the substrate is installed in ~~the~~ a top part of the chamber opposite to the window, and wherein the quasi-optical electrodynamic system is made as one mirror situated out of and lower than the ~~said~~ reaction chamber so as to make it possible to direct ~~the~~ a microwave beam upwards perpendicular to the substrate surface.

12. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in par. 7,~~ of Claim 7 wherein ~~which differs in that~~ the quasi-optical electrodynamic system ~~is made as~~ has one mirror installed so as to ~~make it possible to~~ direct ~~the~~ a microwave beam with normal incidence to ~~the~~ a ~~substrate~~ surface of the substrate or at a low angle to ~~the~~ normal, and a cooled radioparent wall is installed in the reaction chamber, which wall is ~~made as~~ a grating of thin cooled metal tubes or rods and is installed parallel to the surface of the substrate at ~~the~~ a distance longer than $\lambda/2$ from the- substrate.

13. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in par. 7,~~ of Claim 7 wherein ~~which differs in that~~ the quasi-optical electrodynamic system ~~is made~~ has ~~as~~ a mirror and a quasi-optical resonator with plane-parallel mirrors set at ~~the~~ a distance multiple of $\lambda/2$, which resonator is coupled with the electrodynamic system, and wherein ~~one of~~ the resonator mirrors is a surface of the substrate on the substrate holder, and the other mirror ~~is made as~~ comprises a periodic grating of thin metal tubes or rods, wherein a ~~and the~~ ~~grid~~ period of the grid is less than λ.

14. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in par. 8 or par 9, or par. 10,~~ of any one of Claims 8, 9 or 10 wherein ~~which differs in that the~~ a system for pumping gas into the reaction chamber into the region of the plasma formation is ~~made as~~ a concave metal screen with a feeding tube in ~~its~~ a central part, and ~~this~~ the screen is situated over the substrate holder at an adjustable distance, and the system for pumping the gas out is made as a set of apertures in the substrate support, which has ~~some~~ a volume for the evacuated gas mixture, and in this volume the system for water cooling of the upper part of the substrate support is situated.

15. (Currently Amended) ~~Plasma~~ The reactor system ~~as described in part. 12 or par. 13,~~ of Claim 12 or 13 wherein ~~which differs in that the~~ a system for pumping the ~~selected~~ gas mixture in is combined with the grating ~~made of~~ which is thin cooled metal tubes, and wherein the system for pumping the gas out is ~~made as~~ a set of apertures in the substrate holder, which has ~~some volume~~ a portion for the evacuated gas mixture, and ~~in this volume the system~~ a portion for water cooling of ~~the~~ an upper part of the substrate holder ~~is situated~~.